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CENTRAL INTELLIGENCE AGENCY

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INTRODUCTION

1. The firing range SNIP or Sofrino Experimental Firing Range was located in Krasnoarmeysk and was popularly known as "Polygon", /phonetic spelling: Sofrintskiy Nauchnyy Ispedelniy Polygon/. The installation, from 1946 until at least June 1952, was headed by Colonel IVANOV, and I believe it was subordinate to the Armament Department of the All-Union Ministry of Agricultural Machine Building (M.S.Kh.M.) because General ZAKHANITZKI occasionally visited the SNIP range and because the railroad freight cars used by the range were marked "SNIP-MSKhM". From the time of our arrival in November 1946 until mid-1947 this installation supervised the activity of KB-3 in Krasnoarmeysk. Until 1948 the headquarters of the range (which was physically located in the residential area of Krasnoarmeysk) also exercised all the ordinary communal functions, such as postal, registration, and health services for the area. In 1948 this residential area was incorporated as the township of Krasnoarmeysk /see Report [redacted]/ and thereafter SNIP functioned only as a firing range.

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2. According to statements made by Soviets, the firing range had been heavily in use during the war years. After World War II the activity on the range virtually reached a standstill and it was said that plans had been made to disband and dismantle the range; one reason allegedly offered was that the terrace was not sufficiently wide or long for tests with latest weapons. The equipment was therefore to be transferred to a larger range. It was during this period of inactivity that the German specialists arrived in Krasnoarmeysk, and only rarely did we hear firing performed there. After our arrival the facilities and the personnel of the range gradually increased from approximately one hundred Soviets to approximately six hundred, counting not only the personnel working in the headquarters, the emplacement area, but also those who serviced the various installations distributed over the range site.

FUNCTION OF RANGE

3. I am not certain of its primary function, but I believe it was concerned with munition acceptance tests because of the frequent arrival of crates filled with shells via the small gauge rail line from Sofrino. I also believe the range conducted tests of gun barrels because I heard many series of virtually uninterrupted fire (amounting often to 30 rounds) which were especially strong during the years 1950 and 1951. At various times throughout my stay in Krasnoarmeysk I saw guns passing through the town in the direction of the range. I can no longer give the dates, but I remember seeing the following guns: 15-cm. field guns, 20-cm. howitzers, heavy mortar of approximately 15 cm. caliber, and a truck carrying multiple launching guides (Katyusha) presumably for rockets. Once I saw an AA gun on a truck heading

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for SNIP. There was never a stream of guns heading for the range, but at irregular intervals a single gun (mostly self-propelled) would arrive. In addition to the guns cited, missiles were also tested. Throughout the years 1946 to 1952 tests were often carried out at night and would last for periods of four to six hours. Judging from the equipment available on the range, I believe that the tests with the guns cited above were confined to speed measurements.

4. Some missiles designed at the Design Bureau No. 3 were also tested at SNIP. Tests carried out by my section were confined to the year 1947 and early 1948. Thereafter, my group utilized the firing range of KB-3. On the whole missile tests of my group were restricted to range measurements and ground dispersion patterns. The range was not suited for outer ballistic tests such as dispersion or trajectory measurements, (a) because the expanse was not sufficient and, (b) because the necessary instruments were not available. Only on very few occasions were tests made using a rigidly installed cinetheodolite. A German cinetheodolite (Askania) was stored in one of the laboratories of KB-3; however, it was never utilized on the SNIP range.

ACTIVITY OF MY GROUP ON THE SNIP RANGE

5. My knowledge of the facilities and activities on the SNIP range stems primarily from my presence during tests made there in 1947 and 1948; however, some of the observations pertaining to Soviet equipment and tests at SNIP, especially after 1948, are based on evidence seen or heard when passing in the vicinity of the barbed wire enclosure. During the year 1947 and in the beginning of 1948 I repeatedly had recourse to the SNIP range since the KB-3 range was not as yet sufficiently equipped. The utilization of the range involved considerable formalities. For one thing it was necessary to request the use of the range at least one day in advance; then a complete test schedule had to be submitted outlining each individual procedure during the test since the tests were not actually carried out by the German specialists but by Soviet employees of the SNIP range. Reports of the firing tests were made by the Soviet liaison officer between SNIP and KB-3. The liaison officer was usually a member of the Fourth Designing Section of KB-3 /see Report [redacted]. The German witnesses to the tests were escorted on the day of the test to the SNIP range by a Soviet from the Fourth Designing Section. At the entrance to the SNIP range they surrendered their KB-3 identification cards and were issued visitor ID cards for SNIP, which, however, were held by the Soviet guide. The Germans were then led to the actual testing area. The tests which my group carried out on the range were primarily confined to experiments with the ABRS 220 and ABRS 240 missiles. Below appears a chronological description of my activity on the SNIP range.

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Modification of Missile Test Stand

6. Our first contact with the SNIP range occurred when my group was requested to inspect the missile test stand available on the range. We had planned to utilize this combustion chamber test stand for our design work at KB-3. [The test stand is shown on the attached sketch, page 17 as points 23, 24, 25, and 26.] I discovered that the test stand had obviously not been used for several years since most of the equipment was corroded and many parts dismantled. Our first job, therefore, was to put the test stand into working condition. Having serviced the unit, we were able to conduct pressure tests and combustion tests in relation to combustion period.

Construction of Launching Guide

7. While work was carried out on the test stand, my group began design and construction work on a launcher to be used in the firing tests of the ABRS 220 and ABRS 240. From earlier days a launching device was available on the range. This equipment consisted of a guide channel of between 10 and 15 meters, whose elevation could be adjusted.

Tests of the ABRS 220 Missile

8. Having completed the new launcher, [shown as point 20 on the sketch on page 17] we began our tests with ABRS 220 during the beginning of 1947. In my presence approximately 40 to 50 ABRS 220 missiles were fired, but I believe that many more were fired in my absence. The earliest models were built outside of Design Bureau No. 3, but after the completion of the experimental work shops at KB-3, approximately 100 ABRS 220 missiles were constructed there. The following experiments were carried out;

a. Testing of the Flight Stability - For this purpose we occasionally made use of a portable miniature motion picture camera to photograph the trajectory. However, most often we had to rely on visual observation.

b. Impact Points - These were determined for various ranges. First we fired at relatively short distances, and when we found that the missile was stable in flight, we increased the range in order to determine the actual dispersion of the rocket. We determined this on the basis of the ground dispersion patterns.

c. Spoiler Strip Tests - We performed several tests using spoiler strips and offset jets. Also several missiles whose main nozzles had been remachined were tested, because during the first

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tests very gross errors were discerned in the missile manufacture. The re-tooling, however, led to a weakening of the walls so that some of the re-machined missiles exploded during the tests.

d. Other tests - We once fired an ABRS 220 through a wire frame, 10 m. x 10 m., in order to determine the deviation of the trajectory from the theoretically calculated trajectory. Speed tests could not be carried out with the ABRS 200.

Results of the ABRS 220 Tests

9. The over-all result of the tests was that approximately 20 per cent of the tested missiles were stray shots. However, the paths of these stray shots were such that it was unquestionably due to the destruction of the combustion chamber in flight, which in turn was due to the re-machining that was performed on several poorly constructed missiles. On the other hand, the projectiles that did not show any gross manufacturing errors presented an extremely good target pattern. My general opinion is that if the poorly constructed missiles had been discounted, the accuracy which we had theoretically determined would have been achieved and even surpassed. The Soviet attitude, however, was characteristic. They refused to evaluate the tests as a whole and instead kept referring to the stray shots. The chief of KB-3, who had witnessed some of the tests, expressed dismay and declared that the "competing institute" had not encountered strays. [The "competing institute" most likely referred to a Soviet institute located in the vicinity of the Yaroslavskiy Railroad Station in Moscow. See Report] 50X1
I was asked by the chief of KB-3 whether I could give in writing a guarantee that no strays would be encountered in a new series of tests using missiles in which the manufacturing tolerances were more carefully observed. I gave this guarantee and was told by the chief that he would ask for additional funds in order to repeat the tests with the ABRS 220. I later learned that these funds had been refused and also learned from the chief that the KB-3 version of the ABRS 220 had been rejected in favor of a Soviet-developed design, but I can give no details.

Tests of the ABRS 240 ("Molnya") Missile

10. Prior to the test firing of the "Molnya" we made use of the test stand (point 24) [page 17]; during 1947 we conducted several combustion chamber tests under normal conditions and then with extreme variations in the propellant temperature. The purpose of the test was to determine the optimum cross section for the Soviet powder sticks. We also made several stationary tests of the combustion chamber in order to test various chamber parts,

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such as the cross-section of the nozzle and the positioning and configuration of the propellant. We discovered that the pressure for the "Molnya" chamber had to be higher than required in the earlier German constructions. The reason for this was that the Soviet propellant had a higher critical pressure point and a steeper pressure gradient since the Soviet powder grains were apparently more sensitive to heat than the German powder.

11. By the middle or end of 1947 three missiles had been constructed in KB-3, and on the basis of these three the over-all function of the missile was to be tested. I pointed out to the Soviets that it was hardly feasible to determine the performance of the missile on the basis of three projectiles and further that various independent sections required testing first. The Soviets, however, were not to be deterred and insisted on comprehensive tests. This insistence was most likely due to their skepticism regarding the ejection process (release of the "minen"); they seemed to have felt that the ejection process would effect intolerable interferences with the trajectory of the missile and that we could not obtain any half-way sensible hit patterns. The three missiles were fired at an elevation of approximately 15°. The flight was visually observed although it is possible that motion pictures were taken. The purpose of the test was to determine:

a. whether the whole missile is stable in flight;
b. whether the "ejection process" functions properly;
c. the behavior of the ejected "minen" (projectiles).

Test Results of the ABRS 240

12. Of the three missiles fired, two missiles conclusively validated our design. Only the third missile did not eject the "minen" (projectiles) and this was due to a failure of the pyrotechnical fuse. The Soviets had been more careful in the construction of these missile models even though they had made some changes. For example, our design called for the use of leather in parts of the ejection mechanism; instead the construction workshops of KB-3 had used a piston of cardboard. Nevertheless, the ejection process functioned satisfactorily.

Shaped Charge Explosion Tests

13. The tests with "Molnya" were completed by the end of 1947 and I did not return to the SNIP range until the middle of 1948 when I conducted a number of shaped charge tests there. Within the impact area of the range (not shown on the sketch) and approximately 2 km. from the firing emplacements were located several armored plates having a thickness of up to 200 mm. The thickest plates were approximately 1 m. square, while the others

were somewhat larger. Upon these plates I conducted a number of penetration effect tests with shaped charges. This was the last occasion I had for making use of the SNIP range.

SOVIET-CONDUCTED TESTS OBSERVED ON THE RANGE

14. During 1947, while I was conducting one of my tests on the SNIP range, I saw a small heavy-caliber machine gun being tested in the area shown between points 16 and 17 of my sketch [page 17]. The weapon was apparently meant for installation in an aircraft and was equipped with a pneumatic control. When the unit was fired we could hear the discharge of air from the control cylinder. There followed a fairly long fire period (approximately 10 to 15 rounds) at the end of which could be heard a cracking sound and again the discharge of air.

15. During 1949, after I no longer had access to the SNIP range, I observed that artillery projectiles with rocket boosters were fired on the range. Details are not known to me because I observed the firings from a distance and only fleetingly. I noted, however, that shortly after the projectile left the muzzle a rocket was ignited. The combustion period of this booster was roughly three-quarters of a second. I conjecture that the caliber of the projectile was 10 cm., since these were the guns most often seen on the range or passing through Krasnoarmeysk on the way to the range. Also during the year 1949, I observed that a very heavy mortar, with a caliber of approximately 20 cm. and a gigantic base plate, was being tested.

16. In addition to the "normal" artillery testing activity, missiles were also fired on the range. I did not see such tests but base my belief on the sounds I heard; these tests took place during 1948 and 1949. The combustion period of these missiles was somewhere around one second to one and one-half seconds. After this period no more missiles were tested here.

17. During the summer of 1949 or 1950 I also observed engine-propelled aircraft over the SNIP range. I believe that these planes were conducting approach or navigation tests. I did not observe any target firing; details are not known to me.

Possible Tests with "Schmetterling"

18. Several times during 1947, again during 1948, and perhaps once during 1949, I saw Lt. Col. RASHKOV at the SNIP firing range. I met Lt. Col. RASHKOV while I was at GEMA, Berlin, and I know that his specialty was the "Schmetterling" missile and also to a small extent the "Rheintochter". In light of this I believe that his testing activity on the SNIP range dealt with "Schmetterling", but I do not know any details. Since flight tests for ballistics analysis could not be carried out on the range, I suspect that if tests with "Schmetterling" were conducted, they dealt with the propulsion unit.

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Emplacement Area

23. The emplacement area of the SNIP firing range is located immediately on the outskirts of Krasnoarmeysk and I have prepared a memory sketch of the area. /See page 17 which constitutes an enlargement of points 17 through 22 shown in the area sketch in Report [redacted]/ The firing emplacements were surrounded by a double barbed wire fence which was patrolled around the clock by Soviet military personnel. Below appears brief descriptions of the points shown on my sketch:

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Point 1 Fence

Double-strand barbed wire fence, approximately three meters high, surrounding the entire emplacement area. It is possible that this fence has now been extended to enclose the entire firing range of SNIP.

Point 2 Entrance Gate

Steel gate for truck traffic.

Point 3 Street

Leading to Finnish hut settlement and the old bridge over the Vorya River /see Report [redacted]/.

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Point 4 Street

Leading to headquarters building in Krasnoarmeysk.

Point 5 Guard Building

L-shaped wooden building with a 10 - 12 m. frontage, used by guards. The passes permitting access to the range were issued here; 10 to 12 persons of whom a few were in uniform were on duty in this building at any given time.

Point 6 Hangar

Single-story brick structure, 20-25 m. x 10-12 m., having a height of approximately 7 m., probably built during the last stages of World War II. I believe that heavy weapons which were tested on the range were repaired or altered in this building. The hangar was equipped with an overhead crane.

Point 7 Heating Plant

A simple wooden structure probably built during the last war but now dilapidated. A former locomotive boiler that had been converted was fired with logs.

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Point 8 Scrap Heap

Scrap piled at this place was periodically removed by the small gauge freight trains.

Point 9 Explosive Filling Station

Single-story building, 30 m. x 10-12 m., whose floor rested approximately 1 m. above the ground level. I believe that ammunition tested on the range was filled in this building, which was equipped with a few iron assembly tables and standard tools. The first models of the ABRS 220 were assembled here. The individual parts had been constructed in factories outside of the Krasnoarmeysk area. I was present during the assembly of the missile which included the loading of the propellant charges and the fuse. Explosives were not stored here but in another building, point 11.

Point 10 Munitions Storage Pile

Munitions were stored in the open in crates, mostly 75 cm. x 75 cm. x 150 cm., in size, although there were larger and smaller crates. The crates were either unpainted or green, and were surrounded by a barbed wire fence.

Point 11 Munitions Storage Building

Single-story stone building finished in white stucco, 25 m. x 8-10 m., whose floor was 1 to 1.5 m. above the ground level. The building was divided into small chambers each equipped with small window openings. Only munitions about to be tested were stored in this building and this munition was pre-treated to the required temperature. The standard temperature for the explosive was 10° C. Later (by the end of 1947) the requirements were changed, and tests were carried out between the extremes of ± 50° C.

Point 12 Munition Storage Building

Similar structure and purpose as point 11 above.

Point 13 Office of the Filling Engineer

Single-story wooden building.

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Point 14 Filling Station

Two wooden buildings in which dry run warheads were filled with waste sulphur having the same weight as the life-ammo.

Point 15 Protective Wall

The wall which lined the entire length of the firing emplacements had a length of approximately 120 m., a height of 3.5 m., and a width of .50 m. A few small gaps existed in the wall to permit approach to the emplacements. Along the wall and on the side facing the gun mounts (point 17) were five casemate-like projections for purposes of observation. These projections were above the ground and had small openings for entry.

Point 16 Meteorological Tower (See also Detail a on same sketch.)

A steel latticed tower 30 m. high having a base approximately 2.5 m. square. On top of this tower is an anemometer used for finding wind speed and direction, and which is accessible by means of an iron ladder. A platform was provided on the top of the tower for special measurements. Pilot balloons were raised at the tower each day at regular intervals, and weather data gathered by the anemometer and pilot balloons were most likely transmitted to a centralized meteorological station. I do not know whether special telecommunication equipment was available for the transmission of this information.

Point 17 Gun Emplacements

A strip of concrete was located in front of the wall (point 15) at a distance of approximately 15 m.; on this concrete strip five guns could be mounted for firing.

Point 18 Steel Pylons

Two latticed steel portals for the suspension of either Le Boulanger frames or induction coil channels. The elevation of the frames was adjustable. The induction spools were used for the determination of extreme ranges. The suspension system is shown in

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Detail b on the same sketch. The height of the pylons was approximately 20 m. and the distance between them, 3 m. The length of the spool (induction) was approximately 4 m. The spool channel was a latticed arrangement; on each of its two interfaces a coil was attached. The magnetized shell when passing between the two coils set off an induction which was registered on an oscillograph, which permitted the determination of the instantaneous and muzzle speeds. I believe that the oscillograph was located in one of the buildings shown at point 22. Two assemblies were used during tests. One frame assembly was mounted approximately 100 meters in front of the muzzle of the test gun and the other was placed at a greater but unidentified distance from the gun.

Point 19 Steel Portals

Similar to point 18, used for the suspension of either a Boulanger frame or a coil channel.

Point 20 Launching Scaffold

This launcher was used for missile test firings performed by my group. For our tests we used a launching guide having a length of only 8 meters (approximate). The unit consisted of two steel portals which were similar in arrangement to lifting jacks. These jacks had a length of approximately 1 m. The elevation was adjustable and by means of a feed rod the traverse could be raised or lowered. The launching guide in turn was mounted on the traverse.

Point 21 Wire Target

Steel frame with replaceable wire mesh target, 10 x 10 m, constructed approximately 300 m. in front of the launcher (point 20). The pylons were held in place by guy wires. For more accurate tests smaller plywood targets instead of the wire mesh were suspended in the frame. Plywood was also used to determine whether the fins of the [redacted] 240 missile had opened, and to determine the angular position of the missile at this distance from the launcher. The primary purpose of the plywood target, however, was to obtain the dispersion pattern.

Point 23 **Buildings**

An unknown number of houses, each the size of a typical two-family home. The sketch shows only six but there were more in the area bordered roughly by points 10, 11, 12, and 15. The purpose of these buildings was unknown to me.

Point 23 **Safety Bunker**

The bunker, for personnel using the missile test stand (point 24), was constructed into the hillside. No instruments or equipment were stored in this bunker. The safety regulations for the operation of the test stand were extremely rigorous, and we were required to remain in the bunker for the duration of the test although the observation possibilities were very poor from the bunker.

Point 24 **Missile Test Bed**

A concrete slab, 1.2 m. x 2.0 m. x .6 m., used for stationary horizontal tests of missile combustion chambers, was located in this draw. Here I performed the combustion tests with the ABRS 220 and [illegible] 240, and it is possible that the Soviets may have performed some tests with the combustion chamber of the "Sokol" (Falke) missile. The combustion chamber was mounted on a little wagon-like device and held in place by a clamping device consisting of two steel shackles. It is possible that the wagon rolled on either guide rails or little wheels. The test stand was capable of absorbing a thrust of between 5 and 10 tons. The steel clamps were designed to hold combustion chambers of 250 mm. diameter, but if necessary, the clamps could be replaced with other fastening devices so as to permit the testing of larger motors. Tests were generally confined to determining the pressure gradient. For this purpose a [illegible] pressure gauge was connected with the chamber. Thrust diagrams could also be obtained. The piston, however, used in these manometric measurements did not function well. It recorded great oil

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losses so that we had to work very quickly between the preparatory stage and the actual testing to prevent too much leakage. These instruments were located in point 25. It is interesting to note that at any given time either gas pressure tests or thrust tests could be performed but not both at the same time.

Points 25 and 26 Measuring Instrument Rooms

Two concrete walled rooms, 3 x 3x5cms, in which small observation slits were provided in the wall facing the test stand. The firing mechanism for the test stand was located in room (point 25). In room (point 26) were stored instruments such as the "Mayhak" indicator which utilized an inaccurate clock mechanism made from a victrola spring, oil pressure gauge for calibrating the "Mayhak" indicator, and copper tubes used for pressure tests.

Point 27 Storage Shed

A brown, barrack-like wooden building, either one or two stories; I never saw the interior. Towards the end of 1946 when passing this building, I detected the strong odor of "denitro benzol". I had no occasion to pass this building after that date, and I do not know whether this compound was later removed. None of the German designs at KB-3 called for the use of this chemical, which leads me to believe that the supply stemmed from wartime uses of the SNIP range.

Point 28 Patrolled Area

Guards patrolled along this path which probably encloses the entire firing emplacements. I estimate that a total of 16 to 20 guards were on duty at any given time.

Point 29 "Protectors"

Interspersed around the patrolled area were protectors used by guards during inclement weather.

SOVIET PLANS FOR ADDITIONAL TEST STANDS

24. As mentioned in the description, only one horizontal test stand with a capacity of 5 to 10 tons was available on the SNIP range. During our stay the Soviets at various times asked me for information and rough sketches for additional test stands. I do not know whether these were built nor whether the test stands were for the SNIP range or the KB-3 range in Krasnoarmeysk. I believe, however, that SNIP did plan to construct additional test stands.

25. Around 1949 the Soviets requested us to make proposals for a test stand having a capacity of 100 tons thrust. My group submitted data for a vertical as well as a horizontal test stand of that order; additional details are not known to me.

26. During 1951 or 1952 the Soviets requested us to submit ideas on a rotary test stand with which to examine the cyclon effect. This phenomenon was repeatedly encountered in spinned missiles, i.e. they worked well on the test bench but exploded during flight. We could not determine the cause of the explosion. At first we suspected that it was due to the insufficient strength of the solid propellant so that the cylinders which housed the propellants were torn apart by centrifugal force. This theory, however, does not appear satisfactory to me. The strange thing was that the projectiles were stable in flight until the moment of explosion so that it could not have been due to insufficient spin. At any rate a test stand was planned by the Soviets with which the missile's motor could be brought to the number of revolutions which it obtained in actual flight. Two versions of this rotary test stand were submitted. The Soviets, as far as I recall, presented a design in which a driving motor and transmission gears would produce the required motion. The German specialists submitted a version whereby the rotation was not to be obtained by motor and gears but rather by means of an additional rocket chamber equipped with tangential (offset) jets. Our design called for a very robust housing equipped with offset jets. The propellants could be calibrated so as to vary the rotary speed from test to test. Once the required speed was obtained the testing body was automatically ignited. Again, however, I do not know the disposition of these plans and rough designs.

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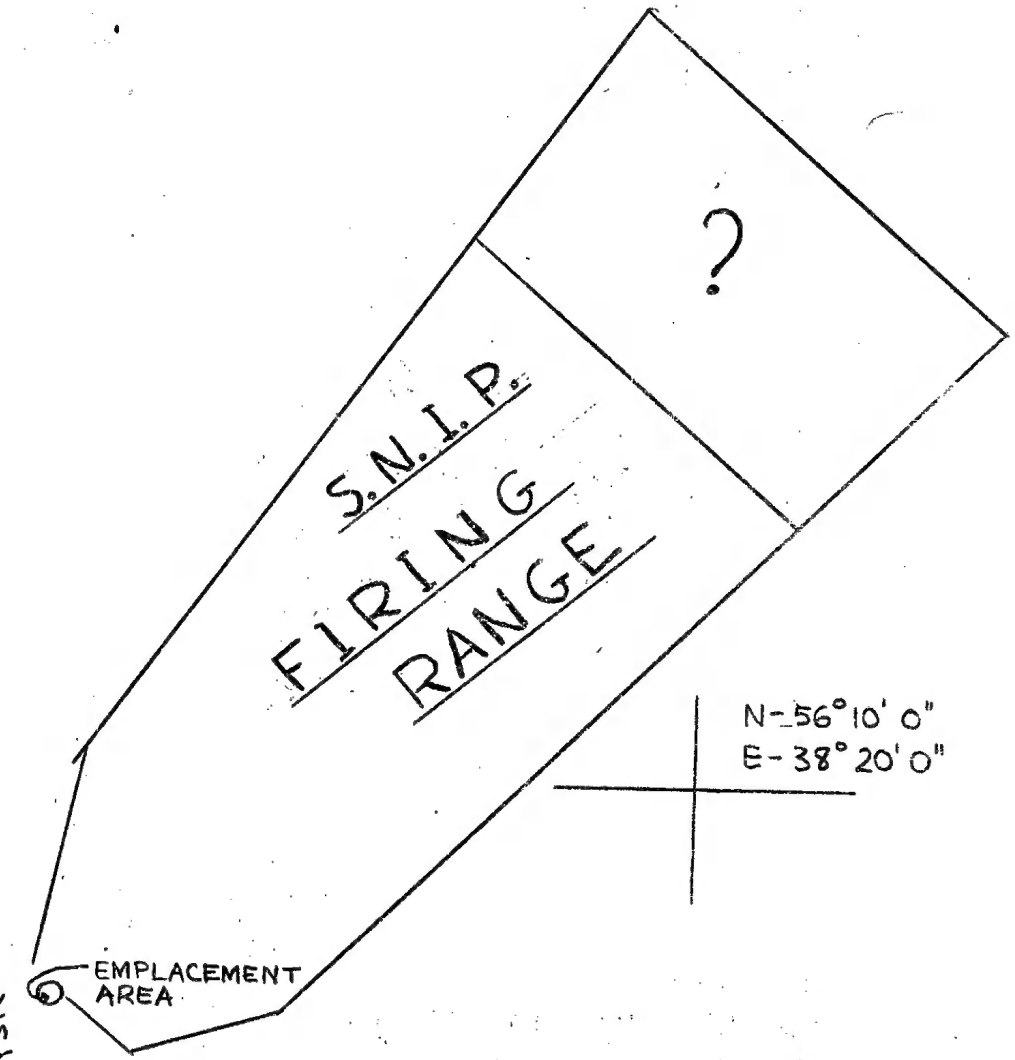

SNIP FIRING RANGE

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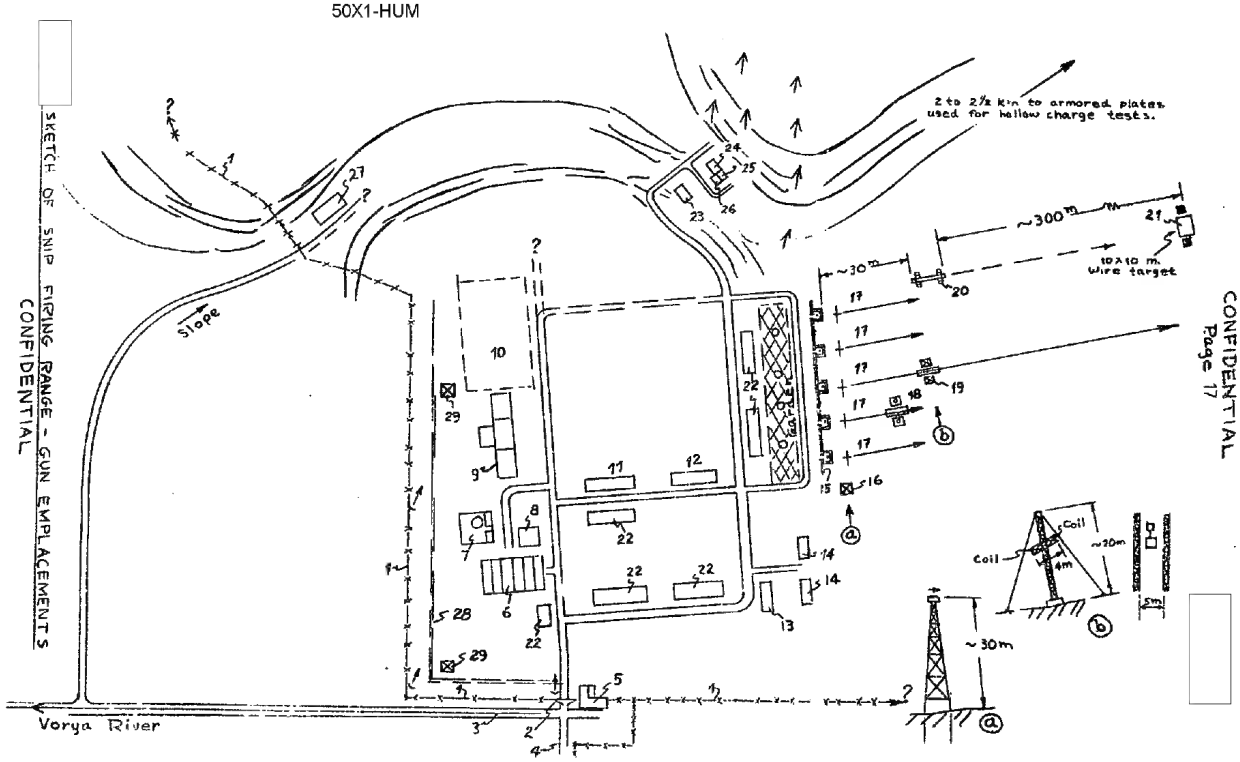

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